Case Report

Bilateral brachial plexus blocks in a patient of hypertrophic obstructive cardiomyopathy with hypertensive crisis

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ABSTRACT

Hypertrophic obstructive cardiomyopathy (HOCM) is a challenge to anesthesiologists due to the complex pathophysiology involved and various perioperative complications associated with it. We present a 50-year-old man, a known case of HOCM, who successfully underwent emergency haemostasis, and debridement of the traumatically amputated right upper limb and the contused lacerated wound on the left forearm under bilateral brachial plexus blocks. His co-morbidities included hypertension (in hypertensive crisis) and diabetes mellitus. He was full stomach and also had an anticipated difficult airway. The management included invasive pressure monitoring and labetalol infusion for emergent control of blood pressure. The regional anaesthesia technique required careful consideration to the dosage of local anaesthetics and staggered performance of brachial plexus blocks on each of the upper limbs to avoid local anaesthetic toxicity. Even though bilateral brachial plexus blocks are rarely indicated, it seemed to be the most appropriate anaesthetic technique in our patient. With careful consideration of the local anaesthetic toxicity and meticulous technique, bilateral brachial plexus blocks can be successfully performed in those patients where general anaesthesia is deemed to be associated with higher risk.

Key words: Anaesthetic, brachial plexus, cardiomyopathy, hypertension, hypertrophic obstructive, local, malignant, nerve block

INTRODUCTION

Hypertrophic obstructive cardiomyopathy (HOCM) is characterized by asymmetric hypertrophy of the interventricular septum, resulting in a dynamic obstruction of the left ventricular outflow tract. Intraoperatively, HOCM patients may develop severe hypotension, myocardial ischemia, acute heart failure or supraventricular or ventricular tachydysrhythmias.[1] Anaesthetic management of a case of HOCM is a challenge even during an elective procedure. Bilateral brachial plexus blocks are seldom performed as indications for these are few[2] and there are potential complications like local anaesthetic toxicity, bilateral pneumothoraces, etc., We present a patient of HOCM in hypertensive crisis who underwent emergency procedures under bilateral brachial plexus blocks.

CASE REPORT

A 50-year-old man, weighing 80 kg, who was 1.58 m tall (body mass index = 32 kg/m^2) was admitted to the emergency room with a traumatic amputation of the right upper limb up to about 5 cm distal to the elbow joint and a contused lacerated wound (CLW) extending circumferentially around the left distal forearm. Both the wounds were badly contaminated and the amputated limb was bleeding. He was on Tab. Amlodipine 5 mg once daily for hypertension and, Glipizide 5 mg once daily and Metformin 500 mg twice daily for type-2 diabetes mellitus since 2 years. He

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was also a known case of HOCM and had undergone alcohol ablation of the interventricular septum one year ago.

He was conscious and oriented. His pulse rate was 120/m and the blood pressure (BP) in his left lower limb was 210/120 mmHg (mean arterial pressure (MAP) = 150 mmHg). A systolic murmur was heard over the left parasternal area. The respiratory system examination was normal. The mouth opening was one-and-a-half fingers breadth, he had Mallampati airway class-3 and the upper two incisors were loose and broken. Neck extension was restricted and the thyromental distance was three fingers breadth.

His haemoglobin was 11 g/dl, blood sugar was 173 mg/dl, blood urea was 26 mg/dl, serum creatinine was 1.3 mg/dl and serum electrolytes were normal. An electrocardiogram revealed a left bundle branch block with left ventricular hypertrophy [Figure 1]. Echocardiography showed a thickened interventricular septum, systolic anterior motion of the anterior mitral leaflet, left ventricular outflow tract gradient of 60 mmHg, left ventricular ejection fraction of 45%, good right ventricular function and no mitral regurgitation. A chest X-ray showed cardiomegaly with no signs of congestive cardiac failure. The cervical spine X-ray revealed spondylotic changes at C_5-C_7.

An intravenous access was secured on the left foot. The right dorsalis pedis artery was cannulated and continuous BP monitoring was initiated. Intravenous fentanyl 150 μg and labetalol 10 mg, followed by an infusion of 2 mg/min, were administered. After 20 min, his heart rate decreased to 106/min and BP to 196/114 mmHg (MAP 140 mmHg). He was scheduled for emergency hemostasis and debridement of the amputated limb and contused lacerated wound. The patient was nil-by-mouth for 2 h.

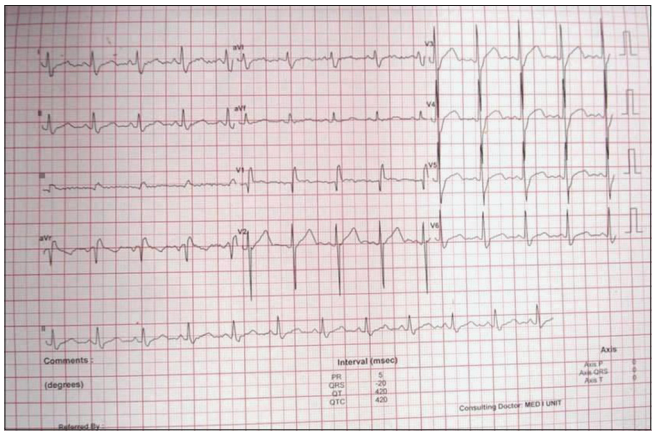

Figure 1: Electrocardiogram showing left bundle branch block with left ventricular hypertrophy

In the operation theater, after applying the standard monitors, the right subclavian vein was cannulated and central venous pressure (CVP) monitoring was initiated. The initial CVP was 4 mmHg. The BP had decreased to 180/110 mmHg (MAP = 133 mmHg) and pulse rate to 90-100/min. It was decided to achieve the hemostasis and debride the amputated limb first, and follow it up with debridement of the CLW.

Right brachial plexus block was performed via a supraclavicular approach using a 23 G needle. After eliciting paraesthesia, a mixture of 6 ml 2% lignocaine and 18 ml 0.5% bupivacaine was injected slowly with frequent aspirations. He was sedated with intravenous midazolam 2 mg following initiation of the block. The debridement and revision amputation were completed in 120 min. Following this, left axillary block was performed with a mixture of 8 ml 2% lignocaine and 30 ml 0.25% bupivacaine using a multiple injections technique. Both the blocks worked adequately. Intraoperatively, the pulse rate and MAP were maintained at 80-90/min and 110-120 mmHg, respectively. The total blood loss was 500-550 ml. The blood sugar was monitored hourly, and it was maintained between 100 and 200 mg/dl with insulin infusion. The surgeries were uneventful and the patient was shifted to the intensive care unit. Analgesia lasted for 6 h post-operatively, which was managed further with fentanyl infusion.

DISCUSSION

HOCM is an autosomal-dominant disease (prevalence = 1 in 500),[1] developing in the absence of pressure or volume overload. The outflow obstruction in HOCM is dynamic, the degree of which is variable and dependent on the ventricular pre-load. The symptoms of HOCM include dyspnea, chest pain, palpitations, dizziness, fainting and sudden cardiac arrest. Medical therapy with beta-blockers, calcium channel-blockers and diuretics may improve symptoms.[1,3] Surgical interventions include surgical septal myectomy, alcohol septal ablation or dual chamber cardiac pacing.[4] However, the incidence of patients with HOCM undergoing incidental surgery is not known. The anaesthetic goal is directed toward minimizing left ventricular outflow tract obstruction, which requires pre-operative optimization, careful

consideration of perioperative medications and fluid therapy, invasive cardiovascular monitoring and adequate post-operative analgesia.

Pre-operative optimization of the BP could not be achieved even though our patient was in hypertensive crisis as he required urgent hemostasis. We had three choices regarding the type of anaesthesia:[1] General anaesthesia with endotracheal intubation/Proseal laryngeal mask airway (PLMA),[2] bilateral brachial plexus blocks or[3] cervical epidural anaesthesia. In a study[5] conducted to identify the perioperative risk factors associated with HOCM, there was a suggestion that patients with general anaesthesia fared worse than those with regional anaesthesia or monitored anaesthesia care.

The advantages of general anaesthesia would have been a decreased duration of surgery as both the teams could have operated simultaneously. The disadvantages of general anaesthesia would have been haemodynamic fluctuations during induction, laryngoscopy, intubation and extubation with potential complications like cerebrovascular hemorrhage, arrhythmias, heart failure and myocardial infarction.[6] Regardless of the pre-operative control, many patients with hypertension display an accentuated hypotensive response to the induction of anaesthesia, followed by an exaggerated hypertensive response to intubation. Use of a PLMA instead of endotracheal intubation could have possibly prevented the haemodynamic fluctuations, but our patient was not adequately fasting. The combination of Mallampati airway class-3 or 4, interincisor distance <4 cm and thyromental distance <6.5 cm has been shown to be associated with difficult intubation.[7] We anticipated a difficult intubation in our patient, who, in addition to having these predictors positive, also had a restricted neck extension and bad dentition.

Cervical epidural anaesthesia would have given good operating conditions, but it could have caused hypotension and bradycardia,[8] which would have been unacceptable in our patient. The epidural was expected to be technically difficult as well in our patient. Cervical epidural anaesthesia may be a viable option in expert hands.

The advantages of brachial plexus block are excellent analgesia and anaesthesia, minimal haemodynamic fluctuations and prolonged post-operative analgesia. However, the disadvantages of bilateral brachial plexus block are that it is time consuming, uncomfortable to the patient, possibility of failure because it usually implies using less local anaesthetic on either side and, more importantly, increased risk of technique-related complications and local anaesthetic toxicity.[2] In our case, by scheduling the surgeries one after the other, we decreased the chances of failure as more volume of local anaesthetic could be injected and, also, decreased the possibility of local anaesthetic toxicity.

The supraclavicular approach was preferred for the amputated right upper limb as the injury was more proximal. This technique brings the needle in proximity to the three brachial plexus trunks that are close to one another, explaining the rapid onset with a high success rate of this approach, and requires a lesser volume of local anaesthetic compared with the axillary approach.[2] Whereas, the axillary block is performed at the level of the terminal branches of the brachial plexus, which are arranged around the axillary artery. The elements to be blocked are more distant from each other and a larger volume of local anaesthetic is required.[2] The volume recommended for the supraclavicular approach is 25-40 ml and for the axillary approach is about 40 ml.[9]

The maximum recommended dose (without adrenaline) of lignocaine is 5 mg/kg and that of bupivacaine is 3 mg/kg for adults.[10] We kept the dose of lignocaine well below the maximum recommended dose for the first block and timed the second block after the peak effect of lignocaine, which is about 25 min following a brachial plexus block.[11] Although we administered the maximum recommended dose of lignocaine (both the blocks put together), it was over a period of 2 h, which is well beyond the peak plasma concentration of the drug. As regards the bupivacaine, the total dose injected was 165 mg, which was below the recommended maximum dose.

Supraclavicular approach to brachial plexus block is associated with pneumothorax, the incidence being 0.5-6.1%.[12] Bilateral supraclavicular blocks should not be attempted because of the risk of overwhelming respiratory compromise due to bilateral diaphragmatic paralysis and the potential of bilateral pneumothoraces.[2] The incidence of pneumothorax following subclavian vein catheterization[13] is about 2.25%. Both the procedures were carefully performed on the same side and a situation of bilateral pneumothoraces was avoided.

Addition of adrenaline to the local anaesthetics would have increased the total dose of local anaesthetic we could have injected. We avoided the use of adrenaline as systemic absorption of adrenaline would have caused tachycardia and accentuated hypertension. In expert hands, ultrasound-guided blocks would have reduced the chances of toxicity further and increased the success rate. Unfortunately, the ultrasound facility was not available in our institute then. However, this case report highlights that even in the absence of facility for ultrasound-guided regional blocks, bilateral brachial plexus blocks can be safely performed with careful consideration of the dosage and pharmacokinetics of the local anaesthetics.

Magnesium sulfate could be a useful adjunct to anaesthesia in the management of patients with HOCM because of its antiarrhythmic, analgesic and vasodilator properties.[14,15] However, use of magnesium sulfate could be associated with systemic hypotension and clinicians need to be aware of its interaction with many other drugs used perioperatively, especially the neuromuscular blocking agents.

CONCLUSION

We chose bilateral brachial plexus blocks for the anaesthetic management of this difficult case because of the anticipated difficult airway in an inadequately fasted HOCM patient in hypertensive crisis undergoing emergency procedure, better haemodynamic stability, post-operative analgesia and patient safety. The availability of clinical expertise, monitoring facilities, advanced technology like ultrasound and post-operative care should also be considered while choosing the anaesthetic technique. The successful and uneventful management of this complicated case with bilateral brachial plexus blocks shows that this technique can be practiced safely in certain case scenarios provided adequate precautions are taken.

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